Terrestrial Mites of New York. V- Tarsonemidae[1]

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Abstract: Twenty-one species of tarsonemid mites are reported from New York, of which 11 are described and figured as new: *Steneotarsonemus* **oconnori**, *Tarsonemus* **ascitus**, *T.* **dubius**, *T.* **imitatus**, *T.* **insignis**, *T.* **irregularis**, *T.* **neotalpae**, *T.* **nidicolus**, *T.* **praesignis**, *T.* **similis** and *T.* **smileyi**. The majority were collected from nests of birds, mammals and insects, and from barn debris. Stored grain tarsonemids were also found in nests of birds, which suggests primary sources of stored grain infestations.

The family Tarsonoemidae includes several species which are important pests of agricultural and ornamental plants (Jeppson, Keifer & Baker, 1975), and egg parasites of pine feeding beetles (Lindquist, 1969a). Other tarsonemids are associated with honey bees (Lindquist, 1968), or with bark beetles (Lindquist, 1969b). Recently, a species of *Daidalotarsonemus* DeLeon found in human skin was believed to be the cause of the more obscure type of skin rashes similar to scabies (Hewitt & Turk, 1974; Mahunka, 1974). But the majority of the species are fungus feeders, of which certain *Tarsonemus* mites are found in stored grain and perhaps play a role in disseminating fungi that deteriorate the stored grain (Lindquist, 1972).

This paper on the taxonomic survey of the mites of New York contains descriptions and records of 21 species belonging to the family Tarsonemidae. Of these, 10 *Tarsonemus* Canestrini & Fanzago and 1 *Steneotarsonemus* Beer are new to science. One *Tarsonemus* is unnamed because of insufficient material. In addition, 5 species previously recorded from New York but not found in the present survey are listed.

The specimens were collected mostly from nests of birds, mammals and insects, and from barn debris through the use of Berlese funnels. The descriptions and records of the species are based on females only because no males or larvae were collected. The present collection from birds' nests is particularly interesting

Acknowledgments: I appreciate very much the help given to me by Dr. E. W. Baker and Mr. R. L. Smiley, both of the Systematic Entomology Laboratory, U.S. Department of Agriculture, and by Dr. E. E. Lindquist, of the Biosystematics Research Institute, Canada Agriculture. I especially thank Mr. B. M. OConnor, of the Entomology Department, Cornell University, for allowing me to study his tarsonemid collection from mammal nests, and Mr. J. R. Philips, of the Department of Forest Zoology, State University of New York at Syracuse, for the loan of his specimens collected from owl pellets.

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because it includes tarsonemids that have previously been found infesting stored grain.

Steneotarsonemus friedmani Smiley

Stenotarsonemus friedmani Smiley, 1967, Proc. Entomol. Soc. Wash. 69: 131.

Remarks. I have not collected specimens of this species. It is known only from the type-locality: van Cortlandt Park, Bronx, New York, taken from leafsheath of a grass. Three female and 1 male paratypes were kindly loaned to me by Mr. R. L. Smiley and have been examined for comparison with *S.* **oconnori**, n. sp., a related species. *S. friedmani* may be distinguished by the short dorsal body setae, by the short rodlike seta of tibiotarsus I group of sensilla, by the simple lanceolate dorsal seta on femur II, and by the slender barbed scapular setae. The spermatheca (bursa copulatrix) is small and rounded; it is large and ovoid in **oconnori**. The male is readily distinguished by the dark punctations on the venter of the propodosoma, and by the elongate striae on coxal plates III; the coxal plates IV are without such ornamentation.

Steneotarsonemus **oconnori**, n. sp.

(Figure 1)

Female. Length of idiosoma 274 μ, width 128 μ (holotype).

Dorsum. Pseudostigmatic organs elongate ovoid, attenuate at both ends, covered with spicules. Scapular setae about ⅓ longer than distance between their bases. Lateral setae of tergite I slender and longer than dorsal setae. Dorsal setae of tergite I stouter than other dorsal setae; that of tergites II–III similarly short and strong, inconspicuously barbed, almost equal in length. Lateral setae of tergite III noticeably stronger than dorsal setae. Setae of tergite IV conspicuously longer and stronger than other setae.

Venter (fig. 1). Apodemes mostly weak and indistinct. Apodemes I broadly v-shaped. Anterior median apodeme short, extending posteriorly to level of apodemes II, sometimes with weakened area between apodemes I & II, without nodule. Apodemes II straight, not clearly united with anterior median apodeme. Transverse apodeme indistinct at middle, visibly stronger laterally. Apodemes III short, with enlarged medial portion indistinct. Posterior median apodeme indistinct. Apodemes IV indistinct anteriorly, with thickened posterolateral ends extending to coxal setae IV. Coxal setae I located on apodemes I, or just posterior to apodemes I in some specimens. Coxal setae I–II short and strong, almost spinelike. Coxal setae III much longer and more slender than coxal setae IV. Metapodosomal lobe large, tongue-shaped. Spermatheca large, ovoid.

Legs. Tibiotarsus I group of sensilla consisting of 2 capitate solenidia, 1 long and 1 short, and 1 pointed seta longer than solenidia. Dorsal seta on femur I large and lanceolate, nearly smooth; that on femur II larger and lanceolate-serrate. Leg IV as long as combined length of femur-genu and tibia of leg III. Spinelike seta on tarsus II located laterad of and shorter than solendion.

Male. Unknown.

Holotype. Female, Freese Road, Tompkins County, New York, January 25, 1975, 2 ft. from nest of *Microtus pennsylvanicus* (Ord), collected by B. M. OConnor.

Paratypes. 5 females, with the same data as holotype except taken from interior, exterior and 2 inches from nest of *M. pennsylvanicus.* Holotype and 2 paratypes are deposited in the New York State Museum & Science Service at Albany; 3 paratypes are in the U.S. National Museum collection.

Remarks. The female of **oconnori**, n. sp. is very close to that of *friedmani* Smiley and *spirifex* (Marchal). *S.* **oconnori**, however, is distinguished from *friedmani* by having a long seta on the tibiotarsus I group of sensilla (this seta is very short in *friedmani*), by the large and lanceolate-serrate dorsal seta on femur II, and by the similarly strong dorsal setae of tergites I–III. In *spirifex*, the dorsal setae of tergites II–III are noticeably small, the metapodosomal lobe is large and broad and not as produced posteriorly as in **oconnori** and *friedmani*, and the scapular setae are strong, narrow saberlike and smooth. These setae are barbed and tapered to fine pointed tips in **oconnori** and *friedmani.* Also the distance between coxae IV is much wider in *spirifex* than in the other species.

This mite is named for its collector, Barry M. OConnor, of the Entomology Department, Cornell University, Ithaca, New York.

Steneotarsonemus pallidus (Banks)

Tarsonemus pallidus Banks, 1899, Proc. Entomol. Soc. Wash. 4: 295. Schaarschmidt, 1959, Beitr. Syst. u. Okol. Mitteleurop. Acarina 1(2): 761.

Steneotarsonemus pallidus, Beer, 1954, Univ. Kansas Sci. Bull. 36: 1267.

Remarks. This species is a destructive pest of strawberries, watercress, and many ornamental flowers and shrubs (Jeppson, Keifer & Baker, 1975). Female *pallidus*, except for the indistinct transverse apodeme, has strong and clearly defined ventral apodemes. It is readily distinguished from others in the genus by the following: The coxal setae I are located very much posterior to apodemes I; the apical segment of leg IV is long, about ⅔ as long as subapical segment and longer than the subapical seta; the tibiotarsus I group of sensilla consist of 2 clublike solenidia, 1 long and 1 short. I have not studied the male. It has been redescribed by Beer (1954), Schaarschmidt (1959) and Ito (1964).

Distribution. S. pallidus appears widely distributed throughout the world. In addition to the type material from Jamaica, New York I have examined 2 females taken from a cyclamen culture, Ithaca, October 27, 1970, by K. Kennedy.

Tarsonemus **ascitus**, n. sp.

(Figure 2)

Female. Length of idiosoma 255 μ, width 166 μ (holotype).

Dorsum. Pseudostigmatic organs elongate ovoid, covered with spicules, 2–3 larger ones distally. Propodosoma and hysterosoma uniformly and conspicuously punctate. Scapular setae shorter than distance between their insertions. Lateral and dorsal setae of tergite I slender and equal in length. Setae of tergite II and dorsal setae of tergite III similarly strong and long, inconspicuously barbed. Lateral setae of tergite III as stout as setae of tergite IV except shorter, all setae with blunt tips and inconspicuously barbed.

Venter (fig. 2). Apodemes fairly strong and well defined. Coxal plates more conspicuously punctate than dorsal surfaces. Apodemes I v-shaped. Anterior median apodeme extending posteriorly and weakly uniting with transverse apodeme, with weakened area just posterior to apodemes II, lacking nodule. Apodemes II straight, clearly not united with transverse apodeme, with posterior medial ends expanded. Transverse apodeme continuous, stronger

laterally, with slight indentation at middle. Apodemes III extending laterally beyond trochanters III, and medially to coxal setae III, lateral extensions with scalloped posterior edges as figured. Posterior median apodeme extending posteriorly to level of trochanters IV, and anteriorly to apodemes III, bifurcate anteriorly. Apodemes IV slightly crooked at middle, extending posterolaterally to coxal setae IV. Coxal setae II–IV similarly slender, about equal in length. Coxal setae I stronger than other setae, located just posterior to apodemes I. Metapodosomal lobe short and broadly rounded.

Legs. Tibiotarsus I group of sensilla consisting of 1 large clublike and 1 slender stalked capitate solenidia, and 1 stout rodlike seta. Tarsus II spinelike seta located laterodistad of solenidion, at distance about equal to length of solenidion. Femur II with small ventral ridge or flange. Leg IV as long as combined length of femur-genu and tibia of leg III.

Male. Unknown.

Holotype. Female, Rt. 20 near Duanesburg, Schoharie County, August 21, 1974, taken from barn hay, by M. D. Delfinado.

Paratypes. 14 females, with the same data as holotype, some are mixed and on same slide with *T. confusus* Ewing. Holotype and 7 paratypes are deposited in the New York State Museum & Science collection at Albany; 7 paratypes are in the U.S. National Museum collection.

Remarks. The dorsal and ventral body punctations, and the characteristic lateral extensions of the apodemes III are distinctive for this new species. *T.* **ascitus**, n. sp. were found in barn debris and hay in association with *T. confusus*.

Tarsonemus confusus Ewing

(Figure 5)

Tarsonemus confusus Ewing, 1939, U.S. Dept. Agr. Tech. Bull. 653: 26. Beer, 1954, Univ. Kansas Sci. Bull. 36: 1173. Smiley, 1969, Proc. Entomol. Soc. Wash. 71: 221.

Remarks. Female *confusus* is readily distinguished by the transverse apodeme having 2 indentations close together at the middle as figured. The posterior median apodeme is sometimes weak anteriorly but clearly bifurcate. The tibiotarsus I group of sensilla consist of 2 capitate solenidia, 1 long and 1 short, and 1 fairly stout rodlike seta. The ventral metapodosomal lobe between coxae IV is small and rounded. The male femur IV is simple and lacks flange or projection; the posterior median apodeme is straight and not bifurcate, and the apodemes III–IV and the posterior median apodeme are united anteriorly. The female of *T. yoshidai* Ito, 1964, is very similar to that of *confusus*, particularly the form of the transverse apodeme. From Ito's figures, *yoshidai* differs mainly by having very long dorsal setae of tergite III in the female, and by the presence of a projection on femur IV in the male.

Distribution. Maryland (type-locality), New Jersey, New York, Virginia, North Carolina, Georgia and California. Several females from New York were taken from nests of *M. pennsylvanicus* (Ord), Ithaca, May 18, 1975, by B. M. OConnor; from bird nests, Sharon Springs, Rt. 20, October 17, 1975, Helderberg, May 6, 1973, Clifton Park, April 27, 1973 & Delmar, April 13, 1973, all by M. D. Delfinado; from barn hay & debris, Rt. 20 near Duanesburg, Schoharie County, August 21, 1974; from roadside debris, Berkshire, Rt. 90, May 16, 1975; from white pine twigs damaged by weevils, Saratoga, May 28, 1975, all by M. D. Delfinado; from milkweed culture, Rensselaerville, July 4, 1970 & from *Vespula* nest,

Ogdensburg, November 1, 1970, by G. Mullen. Additional females were taken from bird nests, Beltsville, Maryland, November 6, 1975, by E. W. Baker & M. D. Delfinado. *T. confusus* is a fairly common tarsonemid found in nests.

Tarsonemus cryptocephalus (Ewing)

(Figure 18)

Pseudotarsonemoides cryptocephalus Ewing, 1939, U.S. Dept. Agr. Tech. Bull. 653: 9.

Tarsonemus cryptocephalus, Beer, 1954, Univ. Kansas Sci. Bull. 36: 1162.

Remarks. The type specimens of *T. cryptocephalus* are in good condition. The females may be readily separated by the elongate metapodosomal lobe, by the stout dorsal setae of tergites II–IV, and by the short anterior median apodeme which is diffused and bifurcate posteriorly. In both sexes, the sensilla of tibia and tibiotarsus of leg I consist of 1 clublike solenidion and 1 rodlike seta, and tarsus II lacks the spinelike seta near the solenidion. The male posterior median apodeme is bifurcate at the posterior ½. *T. lobosus* Suski, 1962, is very likely a synonym of *T. cryptocephalus.*

Distribution. T. cryptocephalus was originally found on avocado from Chile at New York quarantine. In addition to the type material I have examined 2 females from California taken from evergreen pear. The 2 females from New York were collected from a nest in a bird house, Cambridge, April 21, 1976, by M. D. Delfinado. They were found in the nest in association with *T. granarius* Lindquist. This is a new record for the State.

Tarsonemus **dubius**, n. sp.

(Figures 3, 4)

Female. Length of idiosoma 243 μ, width 121 μ (holotype).

Dorsum (fig. 3). Pseudostigmatic organs subspherical, spiculate. Scapular setae ½ longer than distance between their bases. Lateral setae of tergite I as long as dorsal setae. Setae of tergite II stout, inconspicuously barbed, shorter than setae of tergite III. Setae of tergite III strong with lateral setae longer than dorsal setae. Setae of tergite IV 2–3 times as long as other setae, strong and conspicuously barbed.

Venter (fig. 4). Apodemes I v-shaped. Anterior median apodeme indistinct beyond posterior level of apodemes II. Apodemes II straight, weakened near and not strongly united with anterior median apodeme. Transverse apodeme indistinct at middle, strong and curved laterally. Apodemes III extending medially to coxal setae III. Posterior median apodeme short and weak, not bifurcate anteriorly. Apodemes IV weak anteriorly and not clearly united with posterior median apodeme, arcuate. Coxal setae I, II & IV similarly strong and short. Coxal setae III slender and much longer than other coxal setae. Coxal setae I located just posterior to apodemes I. Metapodosomal lobe large, broadly rounded.

Legs. Tibiotarsus I group of sensilla consisting of 1 capitate and 1 clublike solenidia, and 1 rodlike seta longer than solenidia. Genu and femur of leg II each with serrate-lanceolate seta. Spinelike seta on tarsus II located laterad of and shorter than solenidion. Leg IV as long as combined length of femur-genu and tibia of leg III.

Male. Unknown.

Holotype. Female, Freese Road, Tompkins County, New York, January 25, 1975, taken 6 inches from nest of *M. pennsylvanicus* (Ord), by B. M. OConnor.

Paratypes. 6 females, with same data as holotype; 1 female, Farmingdale, Long Island, New York, June 30, 1974, from bird nest, collected by M. D. Delfinado. Holotype and 4 paratypes are deposited in the New York State Museum & Science Service collection at Albany; 3 paratypes are in the U.S. National Museum collection.

Remarks. The long setae of tergite IV will readily separate **dubius**, n. sp. from other species with short or indistinct anterior median and transverse apodemes, and from *piliger* v. Schlechtendal, a species with similarly long setae of tergite IV (see Schaarschmidt, 1959) by the structure of the apodemes.

Tarsonemus fusarii Cooreman

Tarsonemus fusarii Cooreman, 1941, Bull. Mus. r. Hist. nat. Belg. 17: 1. Schaarschmidt, 1959, Beitr. Syst. u. Okol. Mitteleurop. Acarina 1(2): 757.

Remarks. The differences between this species and *T. granarius* Lindquist are primarily as given by Lindquist (1972): Female *fusarii* has ventral apodemes on the gnathosoma; the spinelike seta near the solenidon on tarsus II is present, and it has a ventral ridge on the femur II. Not mentioned is the length of the anterior median apodeme which is noticeably longer than in *granarius*, extending posteriorly beyond apodemes II and approaching but not uniting with the transverse apodeme. I have not seen the male of *fusarii*.

Distribution. T. fusarii appears to be cosmopolitan and occurs in a wide variety of habitats, including granary samples in which *T. granarius* has been found (Lindquist, 1972). Eight females from New York were found in association with *granarius* in ant nest debris, Saratoga, September 29, 1975, by M. D. Delfinado; 1 female, Ithaca, from old lawn clippings, November 2, 1970 & 1 female, Bellport, October 30, 1970, from owl's nest, collected by M. W. Barry; 1 female, Freeville, November 19, 1970, from *Peromyscus* nest, collected by G. C. Eickwort.

Tarsonemus granarius Lindquist

Tarsonemus granarius Lindquist, 1972, Can. Entomol. 104: 1699.

Remarks. Lindquist (1972) discussed in detail the morphological and ecological similarities and differences of this species and of *T. fusarii* Cooreman. Females of *granarius* are readily distinguished from that of *fusarii* by the absence of a spinelike seta near the solenidion on tarsus II and ventral apodemes on the gnathosoma. Also in *granarius*, the anterior median apodeme is noticeably shorter than in *fusarii*, and the spermatheca (bursa copulatrix) is

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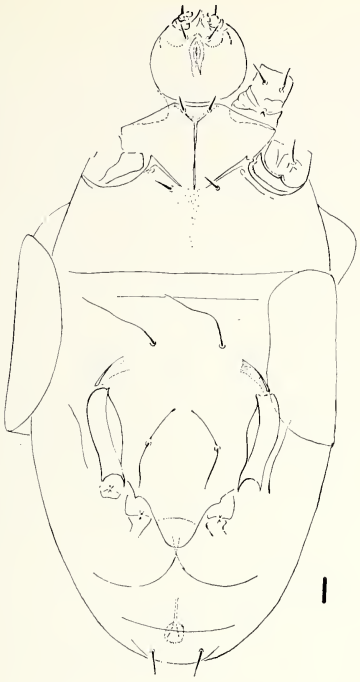
FIGS. 1–20. 1, *Steneotarsonemus* **oconnori**, n. sp., female venter; 2, *Tarsonemus* **ascitus**, n. sp., female venter; 3, *Tarsonemus* **dubius**, n. sp., female dorsum; 4, venter; 5, *Tarsonemus confusus* Ewing, female venter; 6, *Tarsonemus* **imitatus**, n. sp., female venter; 7, *Tarsonemus* **insignis**, n. sp., female venter; 8, femur I; 9, *Tarsonemus* **irregularis**, n. sp., female venter; 10, *Tarsonemus* **neotalpae**, n. sp., female venter; 11, *Tarsonemus* **nidicolus**, n. sp., female venter; 12, *Tarsonemus* **smileyi**, n. sp., female venter; 13, femur I; 14, *Tarsonemus* **praesignis**, n. sp., female venter; 15, *Tarsonemus* **similis**, n. sp., female venter; 16, *Tarsonemus talpae* Schaarschmidt, female venter; 17, *Tarsonemus waitei* Banks, female venter; 18, *Tarsonemus cryptocephalus* (Ewing), female venter; 19, *Xenotarsonemus viridis* (Ewing), female dorsum; 20, venter.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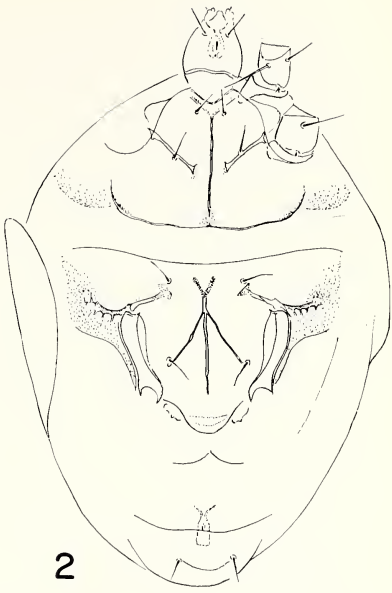
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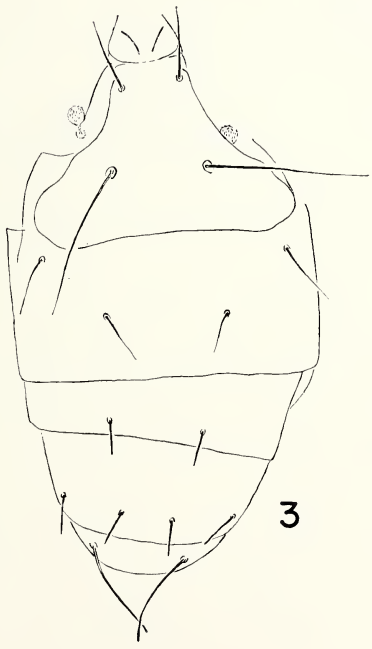
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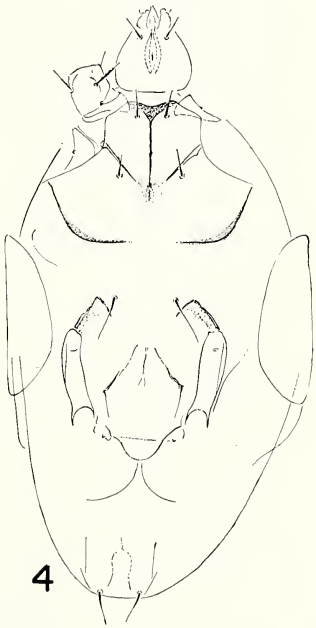
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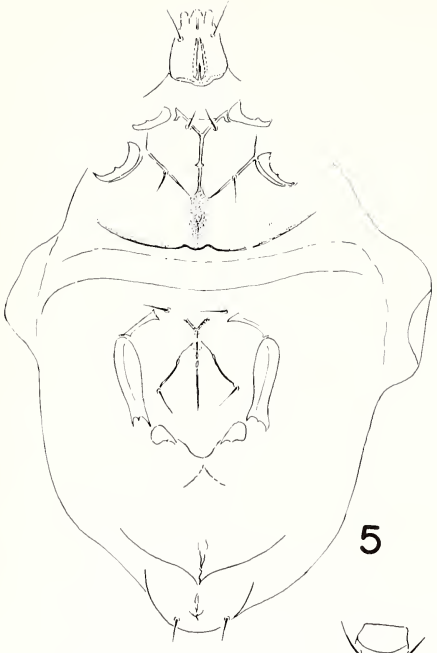
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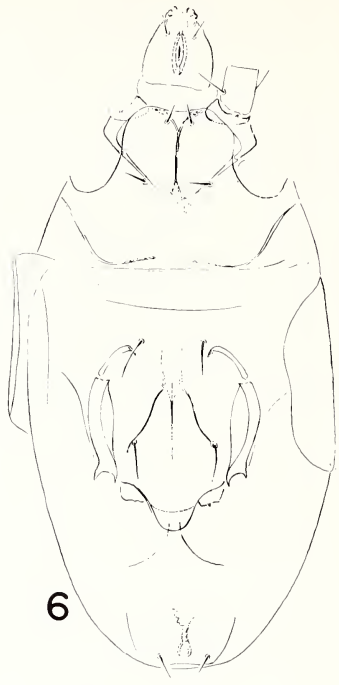
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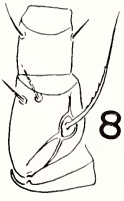
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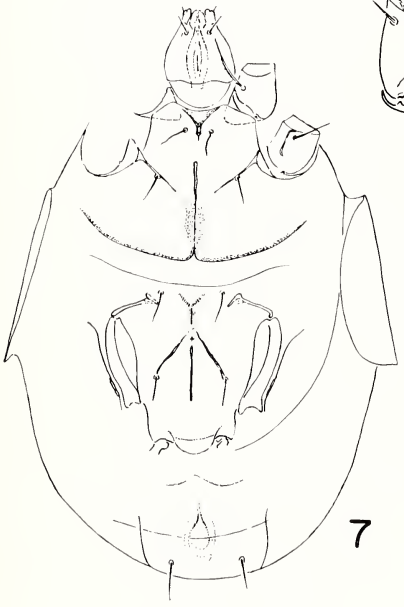
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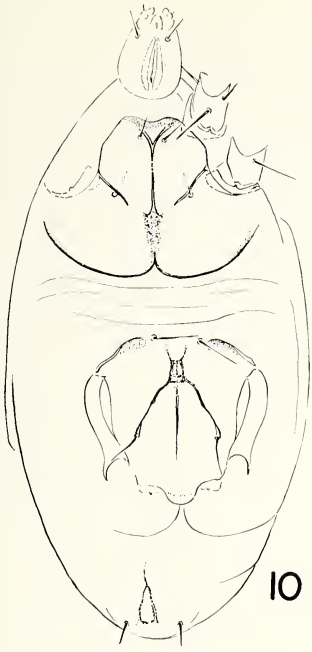

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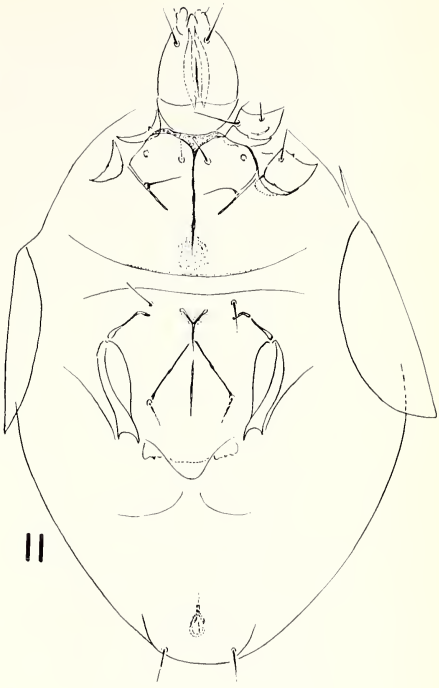

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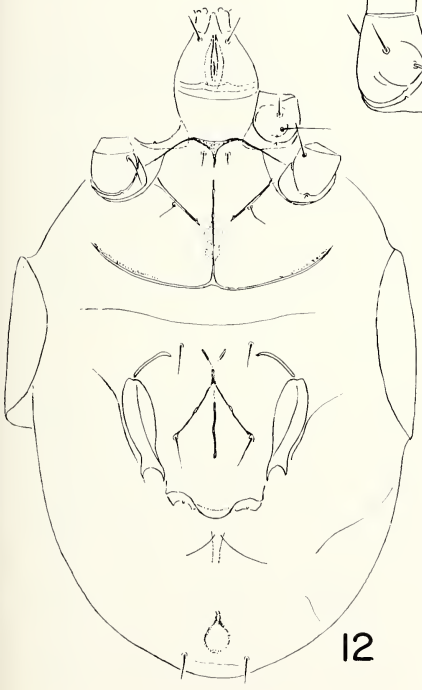

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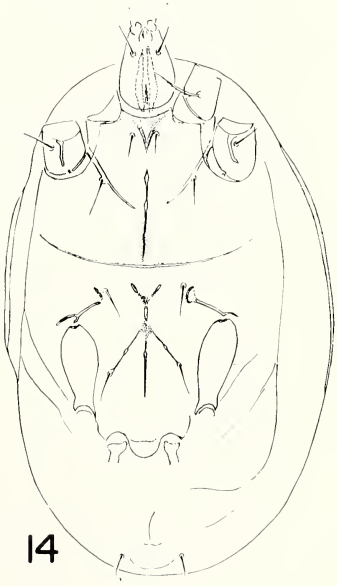

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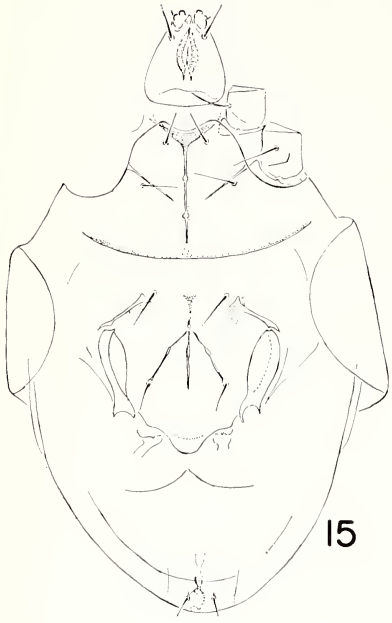

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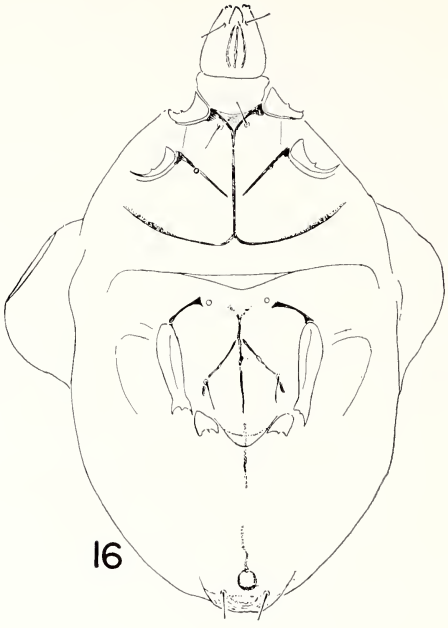

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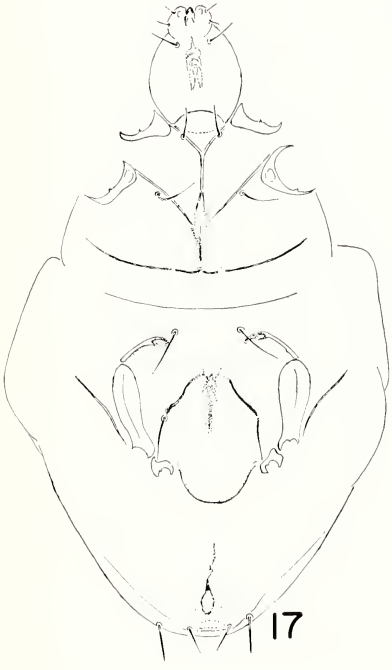

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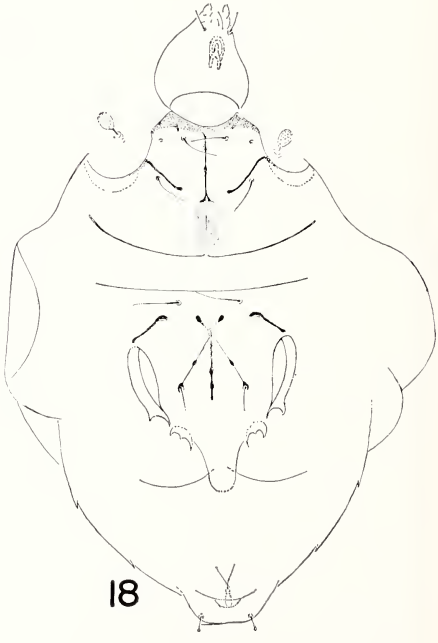

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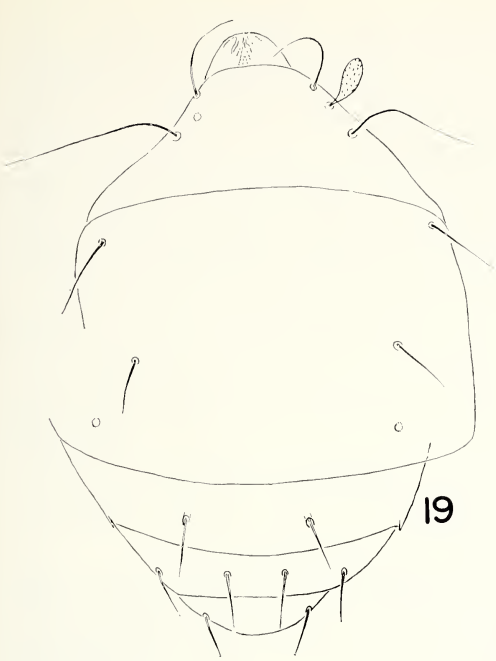

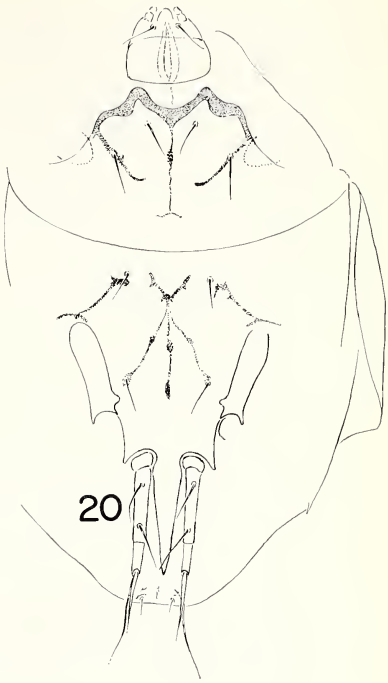

distinctive. I have not seen males of either species; there are apparently minor differences between them as described by Lindquist.

Distribution. T. granarius has been previously collected only from granaries in Canada (type-locality), Japan and Great Britain. It was collected from New York at the following localities: Saratoga, from ant nest debris, September 29, 1975 & 12 females, April 26, 1976, from bird nests; 26 females, Cambridge, April 21, 1976, from bird nests & 1 female, Sharon Springs, Rt. 20, October 17, 1975, from bird nest, all collected by M. D. Delfinado; 1 female, Dryden, October 20, 1970, from an ant hill in open field, collected by G. R. Mullen. The females from ant nest debris and bird nests were found in association with *T. fusarii.*

Tarsonemus **imitatus**, n. sp.
(Figure 6)

Female. Length of idiosoma 223 μ, width 96 μ (holotype).

Dorsum. Pseudostigmatic organs subspherical, spiculate. Scapular setae about twice as long as distance between their bases. Lateral setae of tergite I slender, longer than dorsal setae. Dorsal setae of tergites I–III stout, inconspicuously barbed, almost equal in length. Lateral setae of tergite III and setae of tergite IV barbed, longer and stouter than dorsal setae.

Venter (fig. 6). Apodemes I broadly v-shaped. Anterior median apodeme short, extending posteriorly to level of apodemes II. Apodemes II straight, not clearly united with anterior median apodeme. Transverse apodeme indistinct at middle, strong and curved laterally. Apodemes III with expanded portion extnding medially to coxal setae III. Posterior median

apodeme bifurcate anteriorly, weakened for most of its length posteriorly. Apodeme IV weak, united anteriorly with branches of posterior median apodeme, thus forming a wide M-shaped structure. Coxal setae I shorter than coxal setae II, located on or just posterior to apodemes I. Coxal setae II much stronger than coxal setae I. Coxal setae III–IV long and slender, equal in length. Metapodosomal lobe large, half-moon shaped (that of paratype slightly attenuate posteriorly).

Legs. Tibiotarsus I group of sensilla consisting of 2 solenidia, 1 long capitate and 1 short clublike, and 1 rodlike seta pointed at tip, longer than solenidia. Femur I with short, strong lanceolate-serrate seta; genu II with similar seta but longer. Spinelike seta on tarsus II located posterolaterad of and as long as solenidion. Leg IV slightly longer than combined length of femur-genu and tibia of leg III.

Male. Unknown.

Holotype. Female, Sharon Springs, Rt. 20, New York, October 17, 1975, taken from bird nest, by M. D. Delfinado.

Paratype. 1 female, Etna Road, Tompkins County, January 11, 1975, taken 6 inches from nest of *M. pennsylvanicus*, by B. M. OConnor (this specimen has slightly attenuate metapodosomal lobe and stronger dorsal setae of tergites I–IV). Both holotype and paratype in the New York State Museum & Science Service collection at Albany.

Remarks. This new species is very similar to **dubius**, n. sp. but differs by having shorter setae of tergite IV, by the form of apodemes IV and posterior median apodeme, and by the serrate-lanceolate seta on femur I and genu II. Both **dubius**, n. sp. and **imitatus**, n. sp. are somewhat similar to *lacustris* Schaarschmidt (1959: 764, fig. 25) by the form of the anterior median and transverse apodemes.

Tarsonemus **insignis**, n. sp.
(Figures 7, 8)

Female. Length of idiosoma 243 μ, width 147 μ (holotype).

Dorsum. Pseudostigmatic organs subspherical, spiculate. Scapular setae longer than distance between their bases. Setae of tergite I long and slender, lateral setae longer than dorsal setae. Setae of tergites II–III fairly short, about equal in length, strong and inconspicuously barbed. Setae of tergite IV longer than other setae.

Venter (fig. 7). Anterior median apodeme broadly interrupted posterior to apodemes I, extending posteriorly and uniting with transverse apodeme, with dark spot between apodemes II and transverse apodeme. Apodemes II almost straight, not united with anterior median apodeme. Transverse apodeme indented at middle where anterior median apodeme unites. Apodemes III extending medially near coxal setae III. Posterior median apodeme bifurcate anteriorly. Apodemes IV weakly united with posterior median apodeme. Coxal setae I as long as and as strong as coxal setae II–IV, located posterior to apodemes I. Metapodosomal lobe large, half-moon shaped.

Legs. Tibiotarsus I group of sensilla consisting of 1 large clublike and 1 slender capitate solenidia, and 1 stout rodlike seta. Flange on femur II large and prominent. Femur I lacking flange, ventrally with long, stout and barbed seta on ridge (fig. 8). Tarsus II spinelike seta larger than solenidion. Leg IV about as long as combined length of femur-genu and tibia of leg III.

Male. Unknown.

Holotype. Female, Farmingdale, Long Island, New York, July 14, 1973, from bird nest, collected by M. D. Delfinado & M. J. Abbatiello.

Paratypes. 5 females, with same data as holotype; 4 females, same locality, June 30, 1973, from bird nests, collected by M. D. Delfinado & M. J. Abbatiello. Holotype and 5 paratypes are deposited in the New York State Museum & Science Service at Albany; 4 paratypes are in the U.S. National Museum collection.

Remarks. The females of *T.* **insignis**, n. sp. were found in bird nests in association with *T.* **smileyi**, n. sp. and *T.* **waitei** Ewing. *T.* **insignis**, *T.* **smileyi** and *T.* **praesignis**, n. spp. are characterized each in part by having interrupted anterior median apodeme between apodemes I & II and ventral flange on femur II. In **insignis** and **praesignis** the ventral seta on femur I is stout and barbed; in **smileyi** this seta is slender or normal. *T.* **insignis** may be distinguished by having similarly long and strong coxal setae I–IV, by having the spinelike seta larger than the solenidion and by the short spurlike lateral extensions of apodemes III.

Tarsonemus **irregularis**, n. sp.

(Figure 9)

Female. Length of idiosoma 230 μ, width 115 μ (holotype).

Dorsum. Pseudostigmatic organs subspherical, spiculate. Scapular setae slightly longer than distance between their bases. Lateral setae of tergite I long and slender; dorsal setae short and fairly strong. Setae of tergites II–IV similarly stout and barbed. Dorsal setae of tergite III shorter than setae of tergites II & IV.

Venter (fig. 9). Apodemes I deeply v-shaped. Anterior median apodeme indistinct or weak, uniting with transverse apodeme. Apodemes II straight, indistinctly united with anterior median apodeme. Transverse apodeme fairly strong, indented at middle where anterior median apodeme unites. Apodemes III extending medially to coxal setae III. Posterior median apodeme with very short sclerotized portion, not bifurcate anteriorly, weak or indistinct posteriorly. Apodemes IV indistinct anteriorly and not uniting with posterior median apodeme. Coxal setae I–II shorter than coxal setae III–IV. Coxal setae I located on apodemes I. Metapodosomal lobe large and broad, rounded posteriorly. Spermatheca large and ovoid.

Legs. Tibiotarsus I group of sensilla consisting of 1 short and 1 long capitate solenidia, and 1 rodlike seta. Spinelike seta on tarsus II close to and larger than solenidion. Leg IV as long as combined length of femur-genu and tibia of leg III.

Male. Unknown.

Holotype. Female, Freese Road, Tompkins County, New York, January 25, 1975, taken 2 ft. from nest of *M. pennsylvanicus*, by B. M. OConnor.

Paratype. 1 female, with same data as holotype except taken in interior of nest of *M. pennsylvanicus*. Holotype and paratype are deposited in the New York State Museum & Science Service collection at Albany.

Remarks. The form of the anterior median and transverse apodemes relates **irregularis**, n. sp. to *talpae* Schaarschmidt and **neotalpae**, n. sp. *T.* **irregularis** can be separated by having a large and broad metapodosomal lobe, by apodemes IV not uniting with the posterior median apodeme, and by the large, ovoid spermatheca.

Tarsonemus **neotalpae**, n. sp.

(Figure 10)

Female. Length of idiosoma 223 μ, width 102 μ (holotype).

Dorsum. Pseudostigmatic organs spherical, spiculate. Scapular setae about equal to or slightly longer than distance between their bases. Lateral setae of tergite I much longer than dorsal setae. Setae of tergites II–III similarly short and strong. Setae of tergite IV longer than other hysterosomal setae.

Venter (fig. 10). Anterior apodemes strong and well defined, very similar in form to that of *T. talpae* Schaarschmidt. Anterior median apodeme with weakened or interrupted area posterior to apodemes I, weakened or diffused between apodemes II and transverse apodeme, posteriorly uniting with transverse apodeme. Transverse apodeme deeply indented at middle where anterior median apodeme unites. Apodemes II straight, not uniting with anterior median apodeme. Apodemes III with expanded portion extending medially near coxal setae III. Posterior median apodeme anteriorly with broad cellular neck posterior to its bifurcation and junction of apodemes IV. (In teneral specimens this area is diffused and the cavities are indistinct.) All coxal setae similarly slender. Coxal setae I located just posterior to apodemes I. Metapodosomal lobe short and broad. Spermatheca elongate and gently narrowing towards neck.

Legs. Tibiotarsus I group of sensilla consisting of 2 solenidia, 1 capitate and 1 clublike, and 1 rodlike seta. Spinelike seta on tarsus II located laterad of and as large as solenidion. Leg IV as long as combined length of femur-genu and tibia of leg III.

Male. Unknown.

Holotype. Female, Cranberry Lake, St. Lawrence County, New York, August 1974, from owl pellets, collected by J. R. Philips.

Paratypes. 8 females, with same data as holotype. Holotype and 4 paratypes are deposited in the New York State Museum & Science Service at Albany; 4 paratypes in the U.S. National Museum collection.

Remarks. T. **neotalpae**, n. sp. is close to *T. talpae* Schaarschmidt in many respects but differs by having short and broad metapodosomal lobe, elongate spermatheca, and in that the posterior median apodeme has a broad cellular neck.

Tarsonemus **nidicolus**, n. sp.

(Figure 11)

Female. Length of idiosoma 225 μ, width 134 μ (holotype).

Dorsum. Pseudostigmatic organs narrow subspherical, covered with spicules. Scapular setae equal to or slightly longer than distance between their bases. Setae of tergite I slender and much longer than other setae. All setae of tergites II–IV strong and stout, with blunt tips and tiny barbs.

Venter (fig. 11). Apodemes strong and well defined. Apodemes I nearly straight and T-shaped with anterior median apodeme. Anterior median apodeme posteriorly extending beyond apodemes II, approaching but not uniting with transverse apodeme, dark or cloudy at this area, with 2 nodules and sometimes with weakened area between apodemes I & II. Apodemes II almost straight, not uniting with anterior median apodeme. Transverse apodeme continuous, arcuate. Apodemes III extending medially just posterior to coxal setae III. Posterior median

apodeme with bifurcate end extending anteriorly to level of apodemes III. Apodemes IV almost straight, uniting anteriorly with posterior median apodeme. All coxal setae fairly weak and slender. Coxal setae I located just posterior to apodemes I. Metapodosomal lobe small, slightly attenuate posteriorly.

Legs. Tibiotarsus I group of sensilla consisting of 1 capitate and 1 clublike solenidia, and 1 rodlike seta. Femur of legs I & II each with large ventral flange which may be seen as strong ridge or small protuberance in some specimens if legs not properly oriented. Spinelike seta on tarsus II close to and about as large as solenidion. Leg IV slightly longer than combined length of femur-genu and tibia of leg III.

Male. Unknown.

Holotype. Female, Sharon Springs, Rt. 20, New York, taken from bird nest, by M. D. Delfinado.

Paratypes. 39 females, with same data as holotype; 4 females, Beltsville, Maryland, November 6, 1875, from bird nests, collected by E. W. Baker & M. D. Delfinado; 1 female, Ithaca, New York, May 18, 1974, from interior of nest of *M. pennsylvanicus*, collected by B. M. OConnor; 1 female, Ogdensburg, New York, November 1, 1970, from *Vespula* nest, collected by G. R. Mullen. Holotype and 25 paratypes are deposited in th New York State Museum & Science Service at Albany; 20 paratypes are in the U.S. National Museum collection.

Remarks. The presence of the ventral flange on both femora I & II, the continuous anterior median apodeme which extends to near the transverse apodeme, and the similarly strong and stout setae of tergites II–IV are distinctive for **nidicolus** n. sp.

Tarsonemus **praesignis**, n. sp.

(Figure 14)

Female. Length of idiosoma 166 μ, width 96 μ (holotype).

Dorsum. Pseudostigmatic organs subspherical, spiculate. Scapular setae slightly shorter than distance between their bases. Setae of tergite I long and slender, equal in length. Setae of tergite II and dorsal setae of tergite III shorter than lateral setae of tergite III and setae of tergite IV, all setae fairly strong, with blunt tips and inconspicuously barbed.

Venter (fig. 14). Apodemes well defined. Apodemes I v-shaped. Anterior median apodeme broadly interrupted posterior to apodemes I, posteriorly extending to and weakly uniting with transverse apodeme. Transverse apodeme continuous and arcuate. Apodemes II slightly curved, clearly not uniting with anterior median apodeme. Apodemes III with short spurlike lateral extensions (not seen in paratype specimen after remounting). Posterior median apodeme bifurcate anteriorly, extending to level of coxal setae III. Apodemes IV straight, anteriorly uniting with posterior median apodeme. All coxal setae similarly slender. Coxal setae I slightly shorter than other setae, located posterior to apodemes I. Metapodosomal lobe small, rounded posteriorly. Spermatheca small, bulbous.

Legs. Tibiotarsus I group of sensilla consisting of 1 small clublike and 1 long capitate solenidia, and 1 rodlike seta. Femur II with prominent ventral flange. Femur I lacking flange, with strong barbed seta on ridge similar to that of *T.* **insignis**, n. sp. Spinelike seta on tarsus II large and twice as long as solenidion. Leg IV about as long as combined length of femur-genu and tibia of leg III.

Male. Unknown.

Holotype. Female, Saratoga, New York, July 26, 1973, taken from flycatcher nest, by M. D. Delfinado.

Paratype. 1 female, with same data as holotype. Holotype and paratype are deposited in the New York State Museum & Science Service at Albany.

Remarks. This new species is closely related to **insignis**, n. sp. *T.* **praesignis** may be distinguished by the large spinelike seta near the solenidion on tarsus II, by the apodemes III with short spurlike lateral extensions, and by the transverse apodeme being arcuate and not indented at the middle.

Tarsonemus **smileyi**, n. sp.
(Figures 12, 13)

Female. Length of idiosoma 217 μ, width 128 μ (holotype).

Dorsum. Pseudostigmatic organs subspherical, spiculate, with 1–2 larger spicules distally. Scapular setae slightly longer than distance between their bases. Lateral and dorsal setae of tergite I fairly short and slender. Setae of tergites II–IV similarly short and strong, with blunt tips, inconspicuously barbed.

Venter (fig. 12). Apodemes fairly well defined. Apodemes I v-shaped. Anterior median apodeme broadly interrupted between apodemes I & II, posteriorly extending and uniting with transverse apodeme, area between apodemes II and transverse apodeme diffused or weakened. Apodemes II approaching anterior median apodeme but not uniting with it, inner ends curved. Transverse apodeme arcuate and indented at middle where anterior median apodeme unites. Apodemes III extending medially to coxal setae III. Posterior median apodeme indistinct or weakened at midlength where apodemes IV unite, bifurcate anteriorly. Apodemes IV rather weak, uniting anteriorly with posterior median apodeme, crooked at middle, extending posterolaterally to coxal setae IV. Coxal setae I shorter than coxal setae II–IV. Metapodosomal lobe short and broad, rounded posteriorly. Spermatheca large and globular.

Legs. Tibiotarsus I group of sensilla consisting of 1 large clublike and 1 slender stalked capitate solenidia, and 1 rodlike seta. Spinelike seta on tarsus II near and as large as solenidion. Femur II with small rounded flange, appearing as ridge in some specimens. Femur I ventrally with long and slender inconspicuously barbed seta on ridge (fig. 14).

Male. Unknown.

Holotype. Female, Farmingdale, Long Island, New York, June 30, 1973, taken from bird nest, by M. D. Delfinado & M. J. Abbatiello.

Paratypes. 9 females, with same data as holotype; 2 females, Rt. 20, near Duanesburg, Schoharie County, August 21, 1974, from hay, collected by M. D. Delfinado. Holotype and 5 paratypes are deposited in the New York State Museum & Science Service collection at Albany; 4 paratypes in the U.S. National Museum collection.

Remarks. *T.* **smileyi**, n. sp. is distinguished by having the ventral seta on femur I slender and not as strong as in the related species, from *T.* **insignis**, n. sp. and *T.* **praesignis**, n. sp. by the short coxal setae I, and by similarly short and strong setae of tergites II–IV. Also the flange on femur II is small and not as developed as in the other species.

This mite is named for Mr. R. L. Smiley, of the Systematic Entomology Laboratory, U.S. Department of Agriculture, Beltsville, Maryland.

Tarsonemus **similis**, n. sp.

(Figure 15)

Female. Length of idiosoma 223 μ, width 121 μ (holotype).

Dorsum. Pseudostigmatic organs subspherical, covered with spicules. Scapular setae slightly longer than distance between their bases. All setae of tergites I–IV similarly short and slender.

Venter (fig. 15). Apodemes strong and well defined. Apodemes I arcuate. Anterior median apodeme posteriorly approaching transverse apodeme and not uniting with it, with 2 nodules and 2 weakened spots between apodemes I & II. Apodemes II straight, with inner ends curved, not uniting with anterior median apodeme. Transverse apodeme continuous and slightly curved at middle (may not be noticeable in some specimens). Apodemes III with enlarged portion extending medially to coxal setae III. Posterior median apodeme extending anteriorly to level of apodemes III, with thickened expanded tip but not clearly bifurcate. Apodemes IV slightly curved, uniting anteriorly with posterior median apodeme, extending posterolaterally to coxal setae IV. All coxal setae similarly long and slender. Coxal setae I located just posterior to apodemes I. Metapodosomal lobe fairly small, slightly attenuate posteriorly. Spermatheca small and rounded.

Legs. Tibiotarsus I group of sensilla consisting of 2 solenidia of equal length, 1 clublike and 1 capitate, and 1 rodlike seta longer than solenidia. Ventral flange on femur II small and rounded; that on femur I much smaller, appearing as ridge in some specimens. Spinelike seta on tarsus II close to and smaller than solenidion. Leg IV slightly longer than combined length of femur-genu and tibia of leg III.

Male. Unknown.

Holotype. Female, Delmar, New York, April 13, 1973, taken from bird nest, by M. D. Delfinado.

Paratypes. 12 females, Helderberg, New York, May 6, 1973; 2 females, Clifton Park, April 27, 1973, all collected from bird nests, by M. D. Delfinado; 2 females, Ithaca, Savage Farm, New York, March 20, 1974, taken from exterior portion of nest of *M. pennsylvanicus*, by B. M. OConnor. Holotype and 8 paratypes are deposited in the New York State Museum & Science Service at Albany; 6 paratypes are in the U.S. National Museum collection.

Remarks. The females of **similis**, n. sp. are similar to those of *T.* **nidicolus**, n. sp. *T.* **similis** can be distinguished as follows: all the setae of tergites I–IV are similarly short and slender; both solenidia of tibiotarsus I group of sensilla are of equal length, and the posterior median apodeme is not bifurcate anteriorly.

Tarsonemus talpae Schaarschmidt

(Figure 16)

Tarsonemus talpae Schaarschmidt, 1959, Beit. Syst. u. Okol. Mitteleurop. Acarina 1(2): 764.

Remarks. This species has distinctive and well-defined anterior median and transverse apodemes, the former may be weakened or interrupted for a short distance between apodemes I & II. The apodemes II are strong and straight, approaching the anterior median apodeme but not uniting with it. The posterior median apodeme is normal, bifurcate anteriorly. The ventral metapodosomal lobe is small and attenuate posteriorly. The spermatheca is fairly large and rounded. The male is not known.

Distribution. Europe (exact type-locality not mentioned). Specimens from New York were collected as follows: 2 females, Freese Road, Tompkins County, January 25, 1975, taken 2 inches from and exterior of nest of *M. pennsylvanicus* & 1 female, Spencer Lake, Tioga County, from nest of shrew on stream bank, November 14, 1974, collected by B. M. OConnor; 8 females, Farmingdale, Long Island, from bird nests, June 30, 1973; 2 females, Rt. 20, near Duanesburg, August 21, 1975, from barn hay & 1 female, Delmar, September 3, 1975, from house dust, all collected by M. D. Delfinado. These are also new records for North America.

Tarsonemus waitei Banks

(Figure 17)

Tarsonemus waitei Banks, 1904, Proc. Entomol. Soc. Wash. 14: 96. Beer, 1954, Univ. Kansas Sci. Bull. 36: 1181.

Remarks. Dr. E. E. Lindquist, of the Biosystematics Research Institute, Canada Agriculture, kindly informed me that the specimens which I have determined as *T. setifer* Ewing are *waitei* Banks. Subsequent examination of the type females of both *waitei* and *setifer* suggests that these 2 species are conspecific. I find no significant characters to separate the 2 females. But I cannot be certain because the type males of *waitei* are badly shriveled and unrecognizable for comparison with those of *setifer*. Female *waitei* may be characterized as follows: The transverse apodeme has 2 short weakened areas at the middle which may appear interrupted in some specimens (in the type specimen the transverse apodeme appears weak at the middle). The anterior median apodeme is bifurcate and diffused before or at the posterior level of apodemes II. The apodemes II are strong and straight, ending at the diffused area of the anterior median apodeme. The posterior median apodeme is weak and does not extend anteriorly. The ventral metapodosomal lobe is conspicuously large and broad, rounded posteriorly. The setae of tergites II–IV are strong and barbed, with the dorsal setae of tergite III being longer and stronger than other setae. Sensilla of the tibiotarsus I consist of 1 clublike solenidion and rodlike seta. Tarsus II lacks the spinelike seta near the solenidion. The redescription and figures of *waitei* by Beer (1954) is apparently of a different species. I have not studied the male.

Distribution. T. waitei has been previously recorded from New York. It was recently found in large numbers in nests of birds from the following localities: Sharon Springs, Rt. 20, October 17, 1975; Helderberg, May 18, 1973; Clifton Park, April 27, 1973; Delmar, April 13, 1973 & Farmingdale, Long Island, June 30, 1973; and from *Peromyscus* nest, Niskayuna, April 27, 1973, and from white pine cones, Saratoga, May 22, 1973, all were collected by M. D. Delfinado.

Tarsonemus unnamed sp.

One female collected from a wood duck nest (Saratoga, New York, October 29, 1975, by M. D. Delfinado) resembles *T. crassus* Schaarschmidt, and belongs to the species group having the apodemes III extending laterally beyond trochanters III. It has the following characteristics: The pseudostigmatic organ (1 missing) is large and ovoid, spiculate. The scapular setae are short and weak, about ½ the distance between their bases. The lateral setae of tergite I are seemingly smaller and weaker than the dorsal setae. The anterior median apodeme extends posteriorly beyond apodemes II but does not unite with the transverse apodeme. Apodemes III have long and slender lateral extensions. The apodemes IV are united at midlength of the posterior median apodeme. All coxal setae are weak. Femur II has a prominent ventral flange. The sensilla of tibiotarsus I consist of 1 clublike and 1 slender capitate solenidia, and 1 rodlike seta. The spinelike seta on tarsus II is small

and located very much distad of the solenidion. Leg IV (1 missing) is shorter than combined length of femur-genu and tibia of leg III.

Xenotarsonemus viridis (Ewing)

(Figures 19, 20)

Tarsonemus viridis Ewing, 1939, U.S. Dept. Agr. Tech. Bull. 653: 35.

Xenotarsonemus viridis, Beer, 1954, Univ. Kansas Sci. Bull. 36: 1314.

Remarks. The female *viridis* which is labelled type in the U.S. National Museum collection at Beltsville, Maryland is in very poor condition: only the legs III & IV and the ventral metapodosomal lobe are intact and recognizable. Mr. Smiley, however, kindly loaned me a female specimen which undoubtedly is one of the several specimens on which Ewing based his original description. It has been remounted and is in good condition. The 2 females from New York fit *viridis*. The long, pointed daggershaped metapodosomal lobe which extends to the posterior level of legs IV, and the large and well developed flange on femur II are distinctive characteristics of the female. I have not studied the male; it was redescribed and figured by Beer (1954).

Distribution. Maryland (type-locality). Two females were collected near and from the exterior portion of a nest of *M. pennsylvanicus*, Freese Road, Tompkins County, January 25, 1975 & Ithaca, Savage Farm, New York, March 20, 1974, by B. M. OConnor. This is a new record for the State.

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BOOK REVIEW

Butterflies of West Malaysia and Singapore. W. A. Fleming. 1975. Longman Malaysia Sdn. Berhad, Kuala Lumpur. Vol. 1, x + 64 pp., 54 color plates. Vol. 2, x + 93 pp., 90 color plates. £19.50.

The area specifically covered is roughly the broader distal portion of the Malay Peninsula that extends from mainland Asia toward the Indonesian islands. This is an especially interesting area, not only because of the wealth and intrinsic interest of its species, but because of the vastly complex zoogeography of the whole Indo-Australian Region. A total of 1000 species and 95 additional subspecies are covered, including the Hesperiidae, under the general term 'butterfly'. All species recorded from the area are included. For each are given the general range of the species and more specific records in the area, as well as short notes on identification, habitat and foodplants (when known). Nearly all are illustrated by color photographs, both sexes and the underside being shown in many instances. Considerable preliminary information is given about butterfly characteristics in general and the complex geography of the region.

We are glad to note a plea for the conservation of rare species, some of which are definitely endangered. This is all the more pertinent because of commercial interests in India, Taiwan and the Philippines, and unscrupulous collectors elsewhere, who are flooding the markets with literally hundreds of thousands of specimens.

The author has lived in the region since 1937, and so has wide field experience with the majority of the species. The 1579 illustrations, which show excellent color reproduction, are mostly from his own collection but partly from other collections including the British Museum (Natural History). The nomenclature appears to be up to standard, in general following that of Corbet and Pendlebury's *The Butterflies of the Malay Peninsula* (1956), now out of print. This should be an interesting and worthwhile book for everyone interested in butterflies on a worldwide bases, as well as for specialists in the region.

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